

REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended the independent claims in the application (that is, claims 1, 6, 11, 15, 20, 25, 30, and 35) to recite that the light shielding pattern comprises a resist pattern "including an organic film". Note, for example, page 42 of Applicants' specification. Moreover, Applicants have amended claims 2, 8 and 27 to correct typographical errors therein; compare with, e.g., original claims 3 and 7.

In addition, Applicants are adding new claim 38 to the application. Claim 38, dependent on claim 1, recites that the organic film had a light screening characteristic to the exposure light and has a sensitivity to a light source of a lithography system used in forming the light shielding pattern. Note, for example, the sole full paragraph on page 42 of Applicants' specification.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in rejecting claims in the Office Action mailed January 19, 2005, that is, the teachings of the U.S. Patents to Acosta, et al, No. 6,192,100, and to Lee, et al, No. 5,637,425, under the provisions of 35 U.S.C. §102 and 35 U.S.C. §103.

It is respectfully submitted that the references as applied by the Examiner would have neither taught nor would have suggested such a method of manufacturing a semiconductor integrated circuit device as in the present claims, including, inter alia, the irradiating step, and wherein the irradiating step uses a mask substrate having on a first major surface thereof

a light shielding pattern which is an integrated circuit pattern on a mask and comprises a resist pattern including an organic film. See claim 1. Note also claims 6, 11, 15, 20, 25, 30 and 35.

Furthermore, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested such method of manufacturing a semiconductor integrated circuit device, including use of such mask substrate having such light shielding pattern which comprises a resist pattern including an organic film, and wherein the resist pattern is not provided on the peripheral region of the mask substrate (see, e.g., claim 6); and/or wherein a light screening metal region is provided in this peripheral region (see, e.g., claim 11); and/or wherein a pellicle is contact/fixed in that part of the peripheral portion of the integrated circuit pattern region in which the resist pattern is not formed (see, e.g., claim 15); and/or wherein the light shielding pattern comprising the resist pattern including the organic film is a halftone light shielding pattern which constitutes an integrated circuit pattern on a mask (see, e.g., claim 20); and/or wherein the light shielding pattern which comprises a resist pattern including an organic film is an integrated circuit pattern on a Lebenson type phase shift mask (see, e.g., claim 25); and/or wherein a pellicle is contact/fixed in the peripheral portion of the integrated circuit pattern so as to cover the integrated circuit pattern (see, e.g., claim 30); and/or wherein a protective film is formed on the resist pattern so as to cover the integrated circuit pattern (see, e.g., claim 35).

In addition, it is respectfully submitted that these applied references would have neither disclosed nor would have suggested such a method of manufacturing a semiconductor integrated circuit device as in the present

claims, having features as discussed previously in connection with the independent claims, and having additional features such as (but not limited to) wherein, in the peripheral portion of the first major surface of the mask substrate, a light screening metal region is provided (see, e.g., claims 4, 9, 13, 18, 23, 28 and 33); and/or wherein a pellicle is provided so as to cover the integrated circuit pattern, with this pellicle being in contact/fixed on the light screening metal region (see, e.g., claims 5, 10, 14, 19, 24, 29 and 34); and/or wherein the organic film has a light screening characteristic to the exposure light transmitted through the mask substrate and has a sensitivity to a light source of a lithography system used in forming the light shielding pattern (see claim 38).

According to the present invention, an organic film is included in the light shielding pattern which is an integrated circuit pattern on the mask used in imaging an integrated circuit pattern on a photoresist film formed on a first major surface of a semiconductor integrated circuit device. By utilizing such resist pattern including the organic film, especially wherein the organic film has a light screening characteristic to the exposure light, various advantages are achieved. For example, a metal film etching step for forming the light shielding pattern of the integrated circuit pattern, and the step of removing a resist film used as an etch mask for the metal film etching, can be avoided; and due to this, manufacturing cost of the mask can be reduced. Moreover, accuracy of the mask can be enhanced and defects on the mask can be decreased.

Furthermore, according to various aspects of the present invention, since the pattern including the resist film is not provided in that region of the

outer periphery of the mask with which the mounting portion of the inspection equipment or the aligner is contacted, if is possible to prevent occurrence of foreign matter due to peeling off or shaking-off of the resist film on the mask when the mask is mounted on the inspection equipment or the aligner. Note, for example, pages 50 and 51 of Applicants' specification. See also, for example, additional advantages according to various aspects of the present invention, as set forth on pages 60 and 61, 66, 67, the paragraph bridging 69 and 70 and pages 83 and 84, for example, of Applicants' specification.,.

Acosta et al. discloses an x-ray mask mounting device, called a pellicle, serving to provide a spacing function and to protect the x-ray mask from contamination in semiconductor manufacturing. The device includes a membrane for protection of an x-ray mask, interchangeably positioned with proper spacing between the x-ray mask and the resist on the wafer in which the pattern produced by the x-ray exposure is to be formed. The mounting structure employs the membrane and a rigidity and spacer member, together with a means for selectively separable retention to the supporting structural portion of the mask. The membrane can be removed for cleaning or replacement. See column 2, lines 20-32. In a specific embodiment, this patent discloses that on the face 8 (note Fig. 1) of a thin region 5 of the mask 1, there is an absorber pattern 9 of X-ray opaque material of, for example, Au, W, or TaSi, the absorber pattern 9 being transferred via x-rays 10 across the gap 2 onto an x-ray resist 3, which is on a device wafer 4. See column 3, lines 35-40.

It is respectfully submitted that Acosta, et al, discloses an inorganic, x-ray opaque material as the pattern. It is respectfully submitted that Acosta, et

al, would have neither taught nor would have suggested, and in fact would have taught away from, such a method as in the present claims, including use of the mask substrate having on a first major surface thereof a light shielding pattern which is an integrated circuit pattern and includes a resist pattern including an organic film, and/or other aspects of the present invention as discussed in the foregoing.

It is respectfully submitted that the additional teachings of Lee, et al, would not have rectified the deficiencies of Acosta, et al, such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art. Lee, et al, discloses a method for fabricating a phase shift mask, taking advantage of inorganic resist, designed to be useful for alternate types, having superior light-screening effect. It discloses that the method includes steps of forming a phase shifting film and a screen on a transparent substrate in sequence; forming an impurity layer on the screen; diffusing the impurities of the impurity layer selectively into the screen; removing the regions of the screen which are free of impurities; and selectively removing the phase shifting film. See column 2, lines 1-8. Note also the disclosure column 2, lines 56-60, describing that the invention disclosed therein relates to a phase shift mask employing an inorganic resist as a screen, the inorganic resist having an empirical formula Ge_xSe_{1-x} , and showing the property that diffusion of silver reduces transmittance. See also column 3, lines 1-22.

It is emphasized that Lee, et al, requires an inorganic resist film. It is respectfully submitted that the teachings of Acosta, et al, and Lee, et al, even if properly combinable, would have neither taught nor would have suggested,

and in fact would have taught away from, the presently claimed method, including use of the organic film.

It is emphasized again that Lee, et al, requires an inorganic film as part of the method recited therein. It is respectfully submitted that use of an organic film in the procedure of Lee, et al, would destroy the teachings of this reference for its intended purpose. Clearly, use of Lee, et al, in an obvious rejection, in connection with a process utilizing an organic film as the light shielding film, is improper. See In re Ratti, 122 USPQ 349 (CCPA 1959).

In the paragraph bridging pages 2 and 3 of the Office Action mailed January 19, 2005, the Examiner recognizes that Acosta, et al, discloses use of inorganic materials for the absorber pattern 9 of x-ray opaque material. In the second paragraph on page 4 of the Office Action mailed January 19, 2005, the Examiner also recognizes that Lee, et al, discloses an inorganic resist as the light shielding film. It is respectfully submitted that the teachings of these references, as applied by the Examiner, would have neither disclosed nor would have suggested use of the mask substrate having on a first major surface thereof a light shielding pattern which is an integrated circuit pattern on a mask and comprises a resist pattern including an organic film, as in the present claims, and advantages thereof as discussed previously.

The obviousness-type double patenting rejection as set forth in Item 4 on page 5 of the Office Action mailed January 19, 2005, is respectfully traversed, especially insofar as applicable to the presently amended claims. Thus, claims 1-3 of U.S. Patent No. 6,677,107 define a method of manufacturing a semiconductor integrated circuit device, including, inter alia, use of a mask substrate having, in an integrated circuit pattern region of the

first major surface thereof, a light shielding pattern which, inter alia, comprises a photo resist pattern. It is respectfully submitted that the subject matter claimed in No. 6,677,107 does not disclose, nor would have suggested, such method as in the present claims, including wherein the mask substrate has a light shielding pattern which, inter alia, comprises a resist pattern including an organic film, and advantages thereof as discussed in the foregoing.

The contention by the Examiner in connection with the previously considered claims, that although the conflicting claims are not identical "they are not patentably distinct from each other because the patent claims encompass the application claims", is noted. However, it is respectfully submitted that in a determination of obviousness-type double patenting the issue is not whether the patent claims encompass the application claims, but rather whether the subject matter of the patent claims disclose or would have suggested the subject matter of the application claims, to one of ordinary skill in the art. As seen in the foregoing, it is respectfully submitted that claims 1-3 of U.S. Patent No. 6,677,107 would have neither taught nor would have suggested the presently claimed subject matter, including the resist pattern including the organic film.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to

Deposit Account No. 01-2135 (Case No. 501.39055CX1) and please credit
any excess fees to such deposit account.

Respectfully submitted,



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Attachments